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ABSTRACT

Summarized in this address are the results of a number of nutritional surveys from the sixties and seventies. Nutritional problems have been identified in a number of areas that cut across all socioeconomic and racial groups, the focus being on studies in rural South Carolina, Georgia, and Tennessee. Changes in nutrition with age and changes in nutrition of families involved in a community nutrition program are also looked at. It is argued that, while research in the past decade has brought greater understanding of the nutritional problems of the U.S. population, the same period has seen a change in the nation's eating and buying habits, with more highly processed food being consumed and more meals being eaten away from home. A major challenge for the eighties must be to ensure that these commercially prepared and processed foods are as nutritious, if not more nutritious, as the naturally occurring foods. To do this, the bioavailability of nutrients in processed foods must be assessed. Encouraging signs of progress are the FDA agreement that sodium content be placed on food labels and the guidelines proposed by USDA and HEW concerning fat, sugar, salt, and alcohol intake. (RDN)

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AN OCCASIONAL PAPER

INSTITUTE OF NUTRITION

THE UNIVERSITY OF NORTH CAROLINA

NUTRITIONAL PROBLEMS OF THE SIXTIES AND SEVENTIES AND CHALLENGES OF THE EIGHTIES

BY EDWARD G. HIGH

UD 024018

This address, *Nutritional Problems of the Sixties and Seventies and Challenges of the Eighties,* was given on the occasion of the first annual Percy L. Julian Memorial Lecture. This lecture series is sponsored by The Institute of Nutrition and hosted by North Carolina Agricultural and Technical State University in Greensboro.

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NUTRITIONAL PROBLEMS OF THE SIXITIES AND SEVENTIES AND CHALLENGES OF THE EIGHTIES

Introduction

It is a special honor for me to give the First Annual Percy L. Julian Memorial Lecture sponsored by North Carolina A & T State University and the Institute of Nutrition of the University of North Carolina. I knew Dr. Julian for many years and my last personal association with him was as a National Academy of Sciences Committee Member concerned with getting minorities more involved in the academy's affairs. I am also honored that Mrs. Julian is able to attend this lecture.

Additionally, I had the pleasure of working on the Organizing Committee and of participating in a Nutrition Workshop in October, 1973 held here on this campus and concerned with the Role of the Land-Grant Institutions in Applied Human Nutrition (1). The combination of both of these previous involvements have enhanced my interest and desire to participate in this most significant occasion.

General Problems of the Sixties and the Seventies

During the past decade substantial data have been collected concerning the nutritional status of the American population. From numerous studies and nutritional surveys we have been able to identify nutritional problems in a number of areas which cut across all socio-economic groups. However, until recent years the lower socio-economic groups have been poorly represented in nutrition studies.

Let us look at some of these studies and the problems in various segments of our society. From an historical standpoint, it was found in U.S. Nutritional Status Study and Dietary Evaluation Study (1957-67) by June L. Kelsay (2) that there existed a high percentage of anemia in preschool children and pregnant women, regardless of geographical location. There was a higher percentage of anemia in black children than in white children even when all subjects were from the lower socio-economic level. In general the data clearly suggested that a large

segment of the black children population throughout the nation was undernourished. (The foods most needed to improve the diet were milk, citrus fruits, and vegetables).

In 1968 Christakes et al (3) from a nutritional epidemiological survey on 5th and 6th grade students in New York, found that seventy-three percent of the children's diet was judged to be poor while only seven percent was deemed excellent. Children who ate lunch at school had significantly better diets than those who ate lunch at home or elsewhere. Five percent of the children had follicular hyperkeratosis, 4 percent revealed angular fissures, and 6 percent had gingival redness and hypertrophy. Goiter was found in 7 percent and the girls showed three times the frequency of boys. Eight percent of the children were below normal in anthropometric status. The black children had the lowest mean hematocrit level.

In a study in Mississippi by Owens et al (4), a direct relationship between calories, protein, calcium and vitamin C intake and income was found. All average laboratory values such as hemoglobin, iron, albumin, vitamin A, vitamin C and riboflavin were lower in the lowest income group. Also, growth of the poorer children was less than those of higher incomes. Therefore, a positive relationship appeared to exist between poverty, diet, growth, achievement, and biochemical evidence of suboptimal nutrition—the poverty children being at more risk nutritionally. In a Boston study (Roxbury Section) concerned with school children in a depressed area, Myers et al (5) found that black children's (between the ages of 10 and 13 years) lunch and evening meals were much more unsatisfactory than whites. These results, as well as others, demonstrated the need for school feeding programs *and* parent-teacher orientation to nutrition. Some of the clinical findings of major proportions were: dental pathology, 93 percent; acute gingivitis, 61 percent; dry scaling skin, 52 percent; follicular keratosis, 25 percent; tongue involvement, 25 percent; eye signs, 13 percent; hair signs, 11 percent; bow legs, 15 percent; and heart murmurs, 10 percent: About 22 percent of the children had low hemoglobin values (mostly black girls). Actually, 26 percent of the black children had low hemoglobin values as compared to 9 percent of white children.

A Study in South Carolina

In a South Carolina study (6) associated with a rural area of Beaufort County, we found a large amount of malnutrition and parasitism which was equal to and in some instances greater than we had observed in some of the so called developing countries. For example, we found 26 percent of the children with hemoglobin values less than 10 gm. percent, 30 percent with serum vitamin A levels less than 20μg percent, 51 percent with serum iron less than 40 μg percent, and 14 percent with blood folate values less than 4mμg percent. Gamma globulin levels were elevated in many of the children which was due apparently to repeated infection.

Analysis of the heights and weights of the children indicated a significantly lower rate in growth (undersized) than expected (from the Iowa-Boston norms).

There were 19 children out of 157 whose head circumference was greater than their chest circumference. It has been suggested by the late R.F.A. Dean that if the head circumference is greater than the chest circumference in a child after six months of age, the child is malnourished in 95 percent of the cases.

The dietary data of the children indicated that the white children compared to black children were well-nourished in all areas with the exception of vitamin A. Also, the white children were limited in iron. Many clinical findings substantiated malnutrition in a large number of these children such as dyspigmentation of hair (34 percent), dry and scaling skin (31 percent), cheilosis of the lower lip (28 percent), periodontal disease (31 percent), dental caries (50 percent), bowing of legs (2 percent), distended abdomen (41 percent), and parasitic infection (73 percent).

In connection with the South Carolina Study we reported, in a separate publication, the details on the nutritional vitamin A levels in preschool children (7). Table I summarizes the results of part of this study.

TABLE I

Variation of Serum Carotene and Vitamin A Level with Age (Beaufort County S.C.)

Age	No.	Carotene	Vitamin A	Low to deficient
0-2	6	105.9 (64.8-131.0)	27.1 (10.5-36.3)	2
3-4	17	116.9 (71.2-156.9)	24.8 (8.7-46.7)	4
5-6	14	128.6 (78.4-217.0)	25.4 (11.6-46.8)	5
7-9	12	125.7 (52.4-184.6)	26.2 (16.9-38.7)	3
Total	49			14
Mean		119.3	25.9	

It will be noted that although the plasma vitamin A level remained substantially the same between the 0-9 year old groups, the plasma carotene level increased with age. Also it should be noted that 29 percent of the children exhibited unacceptable vitamin A plasma levels (14/49x100 = 29 percent).

A Study in Georgia

In a study in Taliaferro County, Georgia (8) the vitamin A nutriture was found to be quite low and a high degree of high blood pressure was found

to exist among the adults. It is significant that in the case of children in the age range 3-12 years old, unacceptable levels of vitamin A were found at an alarming 40 percent.

Initial data were collected in January and this was followed with three months of nutrition education and the issuing of food stamps to 281 families. Each family head was invited to the center and transportation was provided at regular intervals to classes where demonstrations and methods to stretch the food dollar were carried out.

TABLE II

Influence of Food Stamps and Nutrition Education on Vitamin A Status (Taliaferro County, Georgia)

		Percent Unacceptable		
Age	No.	Before	After	Percent Change
3-6	73	39	36	+ 3
7-12	162	41	27	+14
13-18	150	36	20	+16
18-35	116	23	7.5	+15.5
35-55	124	11	8	+ 3

The data summarized in Table II clearly indicated the value of such a program. For example, in all age groups studied, ages 3-55 years, significant improvement in vitamin A nutrition was found with the greatest improvement (14 percent-16 percent) in age groups 7-35 years. The least improvement (3 percent) was found in age groups 3-6 years and 35-55 years. Also it should be noted that vitamin A nutriture problems decreased with increase in age.

Studies in Tennessee

In a study in Memphis by Zee (9) concerned with the effect of proverty on nutrition of preschool children, the shocking results were found that half of the children were below the 25th percentile for heights and weights (Iowa-Boston anthropometric charts). Twenty-eight percent of the children less than 3 years of age had hemoglobin levels below 10gm/100 ml and 25 percent of the children older than 3 years of age had levels below 11 gm percent. Lack of food was the main cause. On 57 randomly selected preschool children, the following prevalence were observed: bone age less than 75 percent of chronological age, 27 percent; sickle cell, 12 percent; plasma vitamin A, 44 percent; and mild upper respiratory tract or skin infection, 25 percent.

TABLE III

Variation of Serum Vitamin A and Carotene Levels in Children Participating in the Children and Youth Program

Age Range	Vitamin A (μg. %)	Carotene (μg. %)	Vitamin A Unacceptable Values
0-3 years	22.3 (7.4-31.8)	76.4 (14.6-115.3)	22%
3-6 years	30.9 (16.7-43.2)	96.5 (55.1-137.4)	29%
6-13 years	31.1 (8.2-50.4)	101.7 (18.6-175.0)	17%
Average			20%

35% had low to unacceptable values for vitamin A

In a pilot children and youth study at Meharry (Table III), we found 22 percent of the children to have unacceptable vitamin A levels at ages from 0-3 years and 29 percent at ages 3-6 years. Actually 35 percent of the children had low to unacceptable vitamin A values. After 6 years the unacceptable values for vitamin A decreased to 17 percent as indicated; the vitamin A nutriture problems decreased with increase in age as pointed out in the Taliaferro County study. Using 25μg percent as cut off, 35 percent of the children had low to unacceptable values for vitamin A.

TABLE IV

Variations of Hemoglobin, Hematocrit, and Serum Protein Levels in Children Participating in the Children and Youth Program

Age Range	Hemoglobin (gm./100ml.)	Hematocrit (%)	Protein		A/G
			Albumin gm./100ml.	Total gm./100ml.	
0-3 years	11.2 (7.4-14.0) 33% low	34 (22-39)	4.06 (3.47-4.70)	6.82 (5.63-7.62)	1.54 (.97-2.13)
3-6 years	12.1 (9.9-14.0) 28% low	36 (31-42)	4.16 (3.67-4.39)	7.06 (6.83-7.28) 14% low	1.45 (1.02-1.70)
6-13 years	13.7 (12.0-15.9) 0% low	39 (34-49)	4.25 (3.84-4.88)	7.40 (5.88-8.58) 6% low	1.41 (1.04-1-84)
Average Percent below acceptable	*10.6%*	*12.8%*		*1.06%*	

It will be noted in (Table IV) that 33 percent of the children ages 0-3, had hemoglobin levels below 10gm/100 ml, 28 percent ages 3-6, had levels below

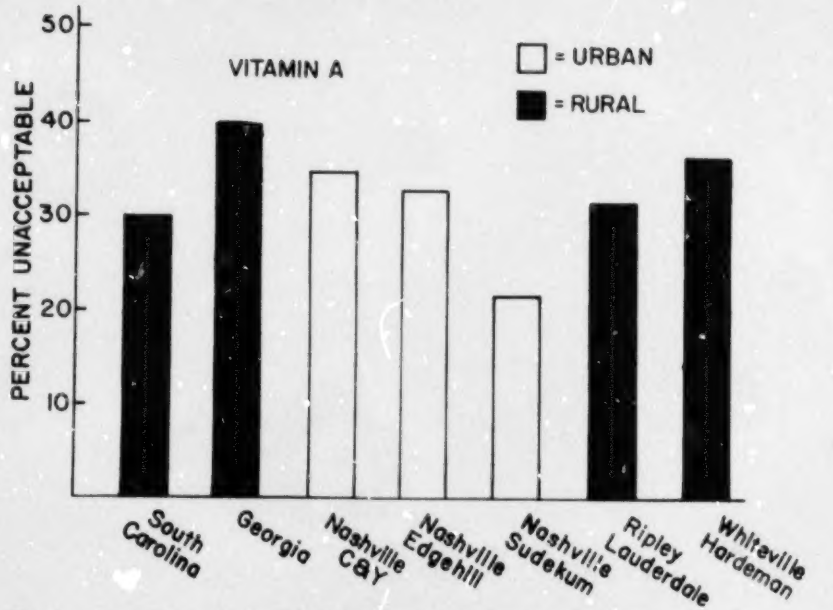


Fig. 1. Comparison of vitamin A nutriture in adults urban and rural communities.

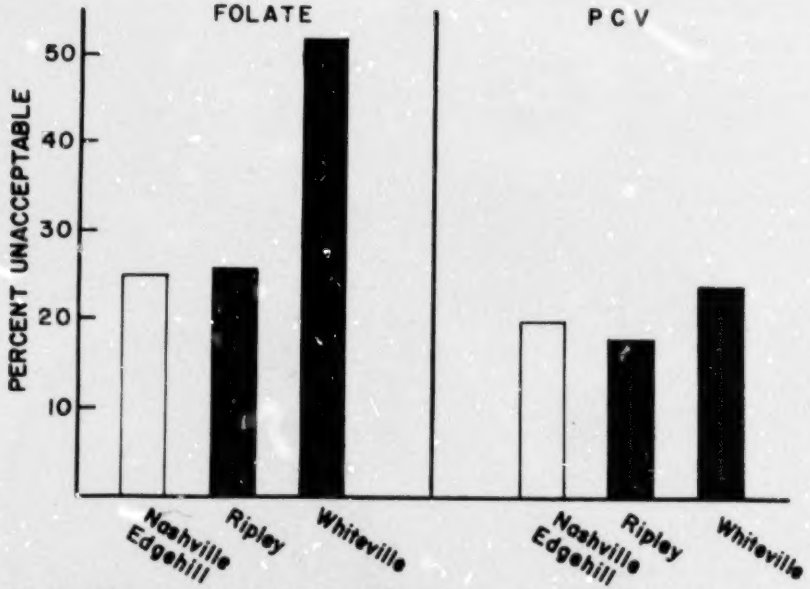
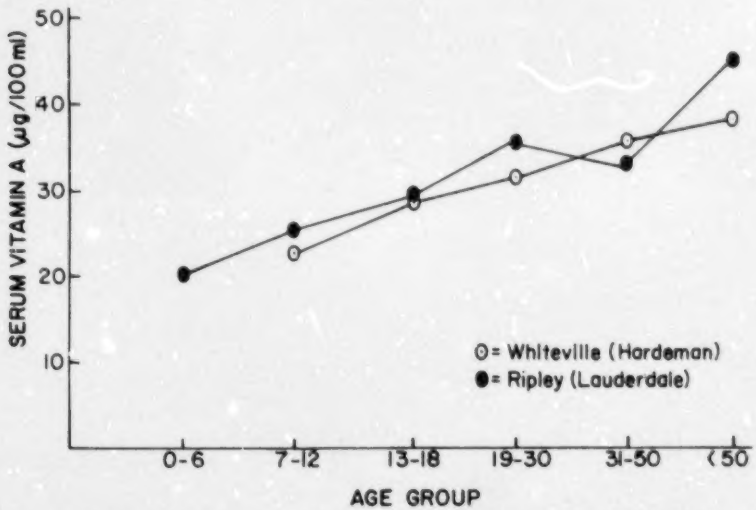


Fig. 2. Comparison of folate and hematocrit in an urban and two rural communities.

11gm percent and none between ages 6-13 years. The albumin globulin ratio decreased with age due to increase in the globulin fraction—principally α-globulin which perhaps is due to various infections during the life of the children. Vitamin A data accumulated from studies in both rural and urban communities in terms of percent unacceptable values are summarized in Figure 1. It will be observed that the unacceptable vitamin A levels (less than 26μg percent) ranged from 40 percent (Georgia, a rural community) to 22 percent in an urban community (Nashville, Sudekum). However, between these two extremes, we found urban areas (Nashville, C and Y and Edgehill) to have slightly higher unacceptable vitamin A values than two rural communities (South Carolina and Ripley). Georgia (Taliaferro County) and Whiteville were the smallest of the rural communities and they had the greatest vitamin A problems.

In Figure 2 are summarized the results obtained in regards to folate and hematocrit in three communities in Tennessee. Two were rural (Whiteville and Ripley) and one urban (Edgehill). Again the greater nutritional problem was found in the smaller rural area for both folate and PCV. In the case of folate the unacceptable values were 52 percent and 25 percent respectively for Whiteville and Ripley and for PCV it was 24 percent to 18 percent respectively. However, the difference between the larger rural area and the urban area was not significant.



Comparison of serum vitamin A levels in 2 rural areas in Tennessee.

Fig. 3. Comparison of the change of vitamin A nutriture with age.

Changes of Nutriture with Age

Now let us turn our attention to change of nutriture with age. Figure 3 illustrates the change in serum vitamin A level with age in two rural areas in Tennessee. With the exception of age group 31-50, all age groups in Whiteville had a

lower mean serum vitamin A level than the corresponding age group in Ripley, although these differences were not grea... In both cases the mean serum vitamin A level increased with age. Because vitamin A is a fat soluble vitamin and readily stored in the body, these observations would be expected.

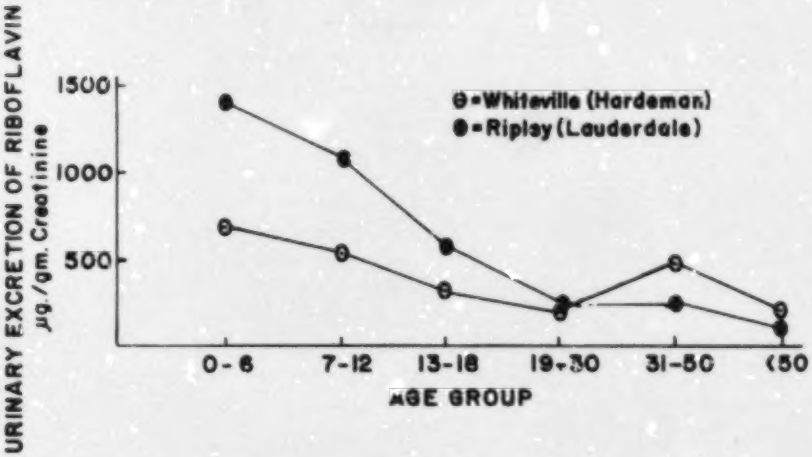


Fig. 4. Relationship of the urinary excretion of riboflavin with age.

Figure 4 illustrates the urinary excretion of riboflavin with age. Participants from Whiteville (the smaller community), exhibited a lower amount of urinary excretion of riboflavin up to the 30 age group. However, between 31-50 age group, there appears to be very little change in riboflavin nutriture. Other studies have clearly indicated a decreased urinary excretion of riboflavin with age as well as other water soluble vitamins as thiamin.

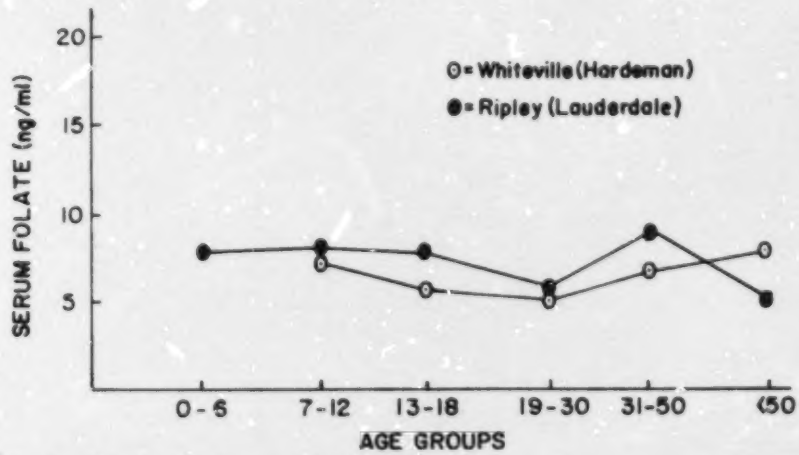


Fig. 5. Relationship of serum folate nutriture with age.

In the case of folate, Figure 5, in both Whiteville and Ripley, serum folate levels changed only slightly with age, although a trend of decrease was observed up to the 19-30 age group. In general the smaller the rural community, the lower serum folate levels.

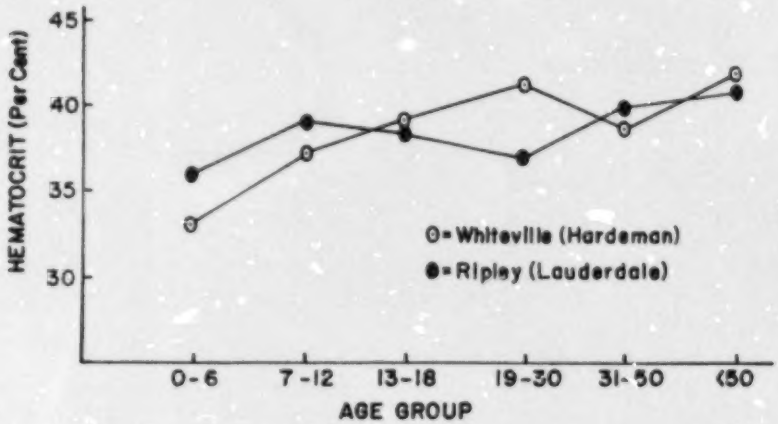


Fig. 6. Relationship of hematocrit values with age.

Figure 6 illustrates the relationship between hematocrit values with age. As expected, hematocrit values increased up to age 12 for both rural communities (Whiteville, and Ripley). Above age 12 hematocrit values exhibited only a slight increase with age.

A Community Nutrition Program

In another study in Nashville by High et al (10) consisting of 75 families in an urban renewal area where we introduced an intervention program consisting of a Community Nutrition Center involving nutrition education and services, we found the following nutritional status changes 15 months after the initial evaluation.

1. Ascorbic acid was inadequate initially in 7 percent of the participants and only 4 percent finally.
2. Riboflavin initially was inadequate in 19 percent as compared to 5.3 percent finally.
3. Thiamine was inadequate initially in 7 percent and it was reduced to 0 percent finally.
4. In the case of serum iron and folic acid we found only slight improvement after a fifteen month period. Similarly, we found very little change in improvement in vitamin A nutriture. The reason for the apparent lack of change is not apparent at this time. Other secondary factors such as absorption and nutrient interaction may have been involved.

These data coupled with our experience in Taliaferro County (Georgia) with

the influence of nutrition education and the Food Stamp Program emphasizes the importance of economics, education, and service to communities in reducing the incidence of malnutrition in our society. To accomplish this, a multifacet team approach must be employed for lasting results.

Challenges for the Eighties

During the past decade as clearly delineated in the foregoing presentation, we have learned a great deal concerning the nutritional problems in our society. The technological explosion in food processing seems to many to have produced an industry which is more concerned with producing new foods in new forms for convenience and taste rather than preserving and transporting the existing food in an economical and convenient manner. We have become a mobile population, eating more foods away from home and more and more commercially prepared and processed foods.

It has been estimated that Americans of today spend $260 billion annually on food, almost half of which goes toward the purchase of highly processed items, including convenience and snack foods. It is claimed that we eat about 40 percent of our meals away from home, spending an additional $105 billion on what is known as the food service business. Due to these changes in the food habits and buying patterns of the American population, consumption of fluid milk, for instance, has slipped more than 30 percent since 1960 with soft drinks being the nation's number-one beverage. It was in 1976 that more french fries, were sold, in tons, than any other frozen vegetable. In this connection there are several other statistics of interest. For example, in 1940 homemakers bought 50 percent of the flour sold in the United States and today they buy 11 percent. Most flour now goes into processed breads, cakes, pies, and buns sold in grocery stores and fast-food restaurants.

With these trends and conjectures coupled with a report of a joint U.S. Department of Agriculture-State University Task Force in which the potential health benefits from human nutrition research were estimated to be in the case of the following:

> "alcoholism—33 percent reduction in the number of cases; anemia and other nutrient deficiences—reduction will improve work efficiency, improve growth and development, and improve learning ability; cancer—20 percent reduction in incidence and deaths; deantal health—50 percent reduction in incidence and severity of periodical disease; diabetes and carbohydrate disorders—50 percent of cases avoided or improved; early aging and length of lifespan—10 million fewer people with impairments, 1 percent improvement per year to 90 percent serving to age 65, bring black life expectancy up to white; heart and vascular disease—25 percent reduction in number of people afflicted and number of deaths, 20 percent reduction in costs; infant mortality and reproduction—50 percent fewer infant and mater-

nal deaths, 3 million fewer children with birth defect; mental health—10 percent fewer disabilities; muscular disorders—10 percent reduction in cases; obesity—80 percent reduction in incidence", etc.

It is clear that those of us who are responsible and concerned with protecting the health of our nation, that we must commit ourselves to do all in our power to ensure that these commercially prepared and processed foods are as nutritious if not more nutritious as the naturally occurring foods.

In this connection a conference is being planned at Meharry Medical College to bring representatives and scientists from industry, government, and educational institutions together to address this subject with particular focus on nutritional requirements and the effect of processing on nutrients in processed foods (11). How much do we know about the bioavailability of nutrients in processed foods? It seems to me that this is our challenge for the Eighties and good basic research data and proper application in this area of good nutritional practice will go a long way in improving the health and welfare of mankind and in eliminating the confusion, myths, and fallacies in which the American population is now wallowing.

In addition to these changes in the food habits and buying pattern of our population, we hear statements made by a well-known food activist, Dr. Michael Jacobson, that the American diet "promotes high blood pressure, strokes, heart disease, obesity, tooth decay, diabetes, and probably certain forms of cancer—certainly bowel or colon cancer and breast cancer. Diet is not the only cause of these afflictions, but it is significant—and if you add them all up, they cause half the deaths Americans succumb to annually." The Senate Select Committee on Nutrition and Human Needs points out that processed food is exceptionally high in sugar and salts and that six out of the ten leading causes of death are linked to over-consumption of fats, cholesterol, sugar, salts, and alcohol. Is it asking too much that we reduce these incidences in the Eighties?

In closing I should point out that there are some positive signs on the horizon. The sales of sugared breakfast cereals dropped by 5 percent last year, the first decline since that cereal category was developed in the 1950s; an increase in salad bars in the fast food industry; and distribution of nutrition information in supermarket chains. Progress is being made by FDA in food labeling: they agree that sodium should be placed on food labels. New guidelines proposed by USDA and HEW concerning fat, sugar, salt, and alcohol in regards to dietary goals are encouraging.

I think the Eighties will present us many nutrition opportunities and challenges in education, research, and application involving committed and serious (cooperative) efforts on the part of our government, industry, and educational institutions.

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